

FIRE RISK, SWISS NEEDLE CAST, AND DOUGLAS-FIR CROWN STRUCTURE IN OREGON COAST RANGE: PROGRESS REPORT

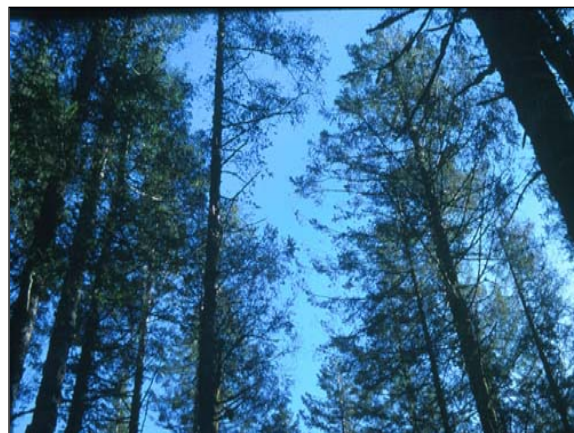
Aaron Weiskittel¹, Doug Maguire¹, and Alan Kanaskie²

¹Oregon State University College of Forestry ²Oregon Department of Forestry



INTRODUCTION

Catastrophic wildfires were an important component of the Oregon Coast Range historically. In fact, some of the largest fires in the state have occurred in this region. Swiss needle cast (SNC), an increasingly important foliar disease of Douglas-fir, may be changing the wildfire risk in this region. SNC may intensify fire risk by enhancing vertical continuity in ladder fuels, increasing rates of fine fuel accumulation, and altering combustion rates through changes in crown bulk density and moisture content. Currently, over 157,000 ha of Douglas-fir forestland in western Oregon have symptoms of SNC, which is indicative of the dramatic increase and importance of this disease in recent years. This study was initiated to examine the relationship between SNC, Douglas-fir crown structure, and fire risk in the region.

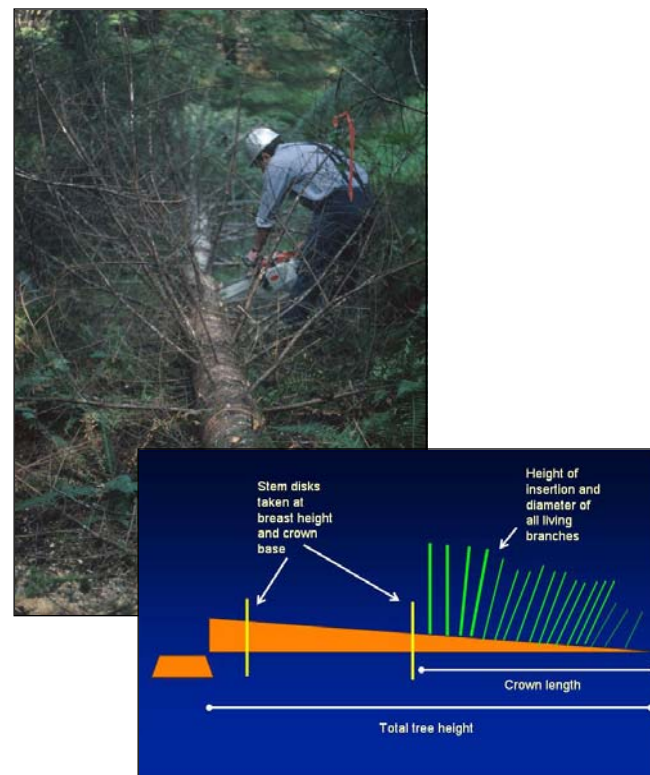


Impacts of SNC on Douglas-fir in Oregon Coast Range. Symptoms include premature foliage loss, needle yellowing, and reduced height and radial growth.

OBJECTIVES

The overall objective of this study was to assess the degree to which stands impacted by SNC experience an increased susceptibility to wildfire. Specific objectives of the project included:

- describing the changes in crown structure and tree morphology resulting from SNC;
- assessing the effects of SNC on stand structure and litter dynamics;
- linking these tree and stand changes to resulting alterations of fuel loads and potential fire behavior in trees with varying degrees of SNC damage;
- establishing the best procedure for rating SNC damage and stand fire risk.



Picture and schematic of destructive tree sampling

FIELD METHODS

In the spring and fall of 2002, 75 trees were destructively sampled from 22 different locations, which varied in stand density, age, and SNC intensity. At each location, 3 to 6 trees similar to and near trees within a permanent monitoring plot were selected for sampling. Prior to felling, diameter at breast height, crown width, density and color were recorded. After felling, annual height increment, total height, and crown length were measured for each tree as well as the height and diameter of every live branch. On all felled trees, a stem disk was cut at breast height and crown base for measuring annual radial growth and sapwood area. Three sample branches from each third of the live crown were randomly selected, labeled, and bagged for transport to the lab. For each sample branch, length, foliated length, average needle retention, and the number of secondary branches were recorded. Foliage samples were also taken for projected leaf area determination, nutrient analysis, and fungal biomass. Ten litterfall traps were placed within 15 plots and have been collected monthly. Components of the sample trees and litterfall are currently being dried, separated, and weighed. A portion of the branch samples are also being used to determine distribution of foliage and branch mass by age class.

DATA ANALYSIS

Vertical distribution of needle and foliage biomass will be characterized across the gradient of SNC intensity by fitting β -distributions to needle and branch data from each tree. Stand-level biomass distribution will be constructed as the composite of individual sample trees and litterfall. Implications for fire risk and behavior will be analyzed with components of existing models. Relationships among these results and sapwood area, foliage mass, foliage retention, crown length, density, and color will also be quantified.

RESULTS

Data on crown shape and structure will be analyzed in the winter of 2003, while crown and stand biomass will be examined in the spring. Results from the litterfall indicate that after eight months, total Douglas-fir needle litterfall varied between 1578.0 to 3775.1 kg/ha, while total Douglas-fir fine woody material litterfall ranged from 55.0 to 619.2 kg/ha. After accounting for other species total litterfall and basal area, a significant relationship between total Douglas-fir litterfall and needle retention, a measure of SNC, exists ($p < 0.05$). A one-year decrease in needle retention is associated with a 2012.5 kg/ha increase in total Douglas-fir litterfall. Project completion is expected by September 2003.